

5.4 Factoring Polynomials

GCF

ex 1:

$$3x^2 + 6x$$

$$3x(x + 2)$$

Regular

ex 2:

$$x^2 - 2x - 8$$

$$(x+2)(x-4)$$

ex 3:

$$6x^2 - 11x - 10$$

$$6x^2 - 15x + 4x - 10$$

$$3x(2x-5) + 2(2x-5)$$

$$(2x-5)(3x+2)$$

$$ax^2 + bx + c$$

$$\begin{array}{r} 1 \ 8 \\ 2 \ 4 \end{array}$$

+c same sign

-c different signs

$$\begin{array}{r} -60 \\ 6 \ 10 \\ 4 \ 15 \end{array}$$

ex 4:

$$8x^2 + 14x + 5$$

$$\begin{array}{r} +40 \\ 4 \ 10 \end{array}$$

$$8x^2 + 4x + 10x + 5$$

$$4x(2x+1) + 5(2x+1)$$

$$(4x+5)(2x+1)$$

Patterns

$$\text{i. } a^2 - b^2 = (a+b)(a-b)$$

$$\text{ii. } a^2 - 2ab + b^2 = (a-b)^2$$

$$\text{iii. } a^2 + 2ab + b^2 = (a+b)^2$$

ex 5:

$$4m^2 + 4m + 1$$

$$2m \cdot 1 = 4m$$

$$(2m+1)^2$$

ex 6:

$$x^3 - 12x^2 + 36x$$

$$x(x^2 - 12x + 36)$$

$$x(x-6)^2$$

$$(x-6)(x-6)$$

$$x^2 - 12x + 36$$

ex 7:

$$y^2 - 49$$

$$(y+7)(y-7)$$

$$(y)^2 - (7)^2$$

ex 8:

$$4x^{10} - 9y^8$$

$$(2x^5)^2 - (3y^4)^2$$

$$(2x^5 + 3y^4)(2x^5 - 3y^4)$$

ex 9:

$$4x^{2n} - 16y^{4n}$$

$$\left(\frac{2x^n}{4x^{2n}}\right)^2$$

$$(2x^n)^2 - (4y^{2n})^2$$

$$(2x^n + 4y^{2n})(2x^n - 4y^{2n})$$

If a problem is not factorable,
then write:

Prime

2 New Patterns

iv. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
Sum of cubes

v. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
Difference of cubes

ex 10:
 $8u^3 + v^3$

ex 11:
 $27x^3 + y^3$

$$\begin{array}{l} a = 3x \\ b = y \end{array} \quad \begin{array}{l} (a+b)(a^2 - ab + b^2) \\ (3x+y)(9x^2 - 3xy + y^2) \end{array}$$

ex 12:
 $64 - x^3$

ex 13:
 $x^6 - y^6$

Four term (or five term) Polynomials
(Grouping)

ex 14:
 $xy + 5x + 3y + 15$

ex 15:
 $ax + bx + a + b$

HW:
p242-243
15-39odd